

Many-body localization in disordered spin and Hubbard chains

P. Prelovšek^{1,2}

¹*J. Stefan Institute, Ljubljana, Slovenia*

²*Faculty of Mathematics and Physics,
University of Ljubljana, Ljubljana, Slovenia*

Many-body localization (MBL) is the quantum phenomenon involving the interplay of disorder and particle interaction, characterized mainly by the nonergodic behaviour. It is intensively investigated theoretically within disordered one-dimensional many-body models, and experimentally in optical lattices of cold atoms, but might be relevant also for materials with spin chains. In the talk the evidence for the transition to MBL will be presented as obtained from numerical studies of finite systems. Within a random-field spin chain dynamical staggered correlations can be used as an indicator for the MBL phase and are closely related to the dynamical spin conductivity and d.c. transport. An analytical approach, based on the self-consistent treatment of dynamical correlations, indicates that one dimension might still be singular with the subdiffusion in the ergodic phase. On the other hand, an analogous simulation of the Hubbard chain indicates that disordered potential does not induce full MBL but only charge localization, while spin correlations remain ergodic.